

THE WEATHER AND CIRCULATION OF AUGUST 1966

Cool and Wet from the Rockies to the Appalachians

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1. MEAN CIRCULATION

The large-amplitude, low-zonal-index 700-mb. circulation of July 1966 [1] was replaced in August by high-index flow (figs. 1 and 2). Much of this change was related to the development of a strong blocking High over Davis Strait. The positive height anomaly center with this ridge reflects an apparent retrogression from the positive center at 50° N., 30° W. in July. Heights at 700 mb. in mid-Atlantic fell as much as 500 ft. (fig. 3) as blocking became established at high latitudes over the Atlantic and North America. Fast, zonal flow then prevailed across the Atlantic in August as the westerlies were displaced slightly south of normal. The primary track of migratory cyclones, also farther south than normal, was almost coincident with the axis of negative 700-mb. height anomaly (fig. 2).

Long waves over North America retrograded from July to August. The trough along the east coast in July extended in August from Labrador to the Southern Plains (fig. 1). At the same time the ridge formerly over the Midwest moved to the Rocky Mountain States and was much weaker. Mean sea level pressure averaged above normal over nearly all of North America, except in northeastern United States where pressures were 1–2 mb. lower than normal. Greatest departures were 8 mb. above normal associated with upper-level height anomaly centers in Davis Strait and the Arctic Ocean north of Alaska.

The circulation across the Pacific also became more zonal in August with the principal trough extending from the eastern Bering Sea south to near 40° N. Wind speeds at 700 mb. ahead of this trough were more than 15 meters per second, the strongest westerlies observed in the Northern Hemisphere during the month. The trough along the Pacific Coast, while considerably weaker in August than in July remained essentially stationary.

Over Asia the circulation featured a trough which extended from the deep Low near Novaya Zemlya southward to 50° N. This region was dominated by a ridge in July.

2. TEMPERATURE

August was unusually cool from the Rockies to the Appalachians as temperatures averaged as much as 6°F. below normal (fig. 4). This was in marked contrast with July [1] when temperatures in the same region were well above normal. In many areas this August ranks as one of the coolest of record. This was the coolest August ever observed at Wichita Falls, Tex., and the coolest since 1911 at Bismarck, N. Dak. Many cities had an unusually small number of days with temperatures of 90°F. or more. At Huntington, W. Va., the maximum temperature was only 87°F., the lowest maximum for any August in a record dating to 1897.

Hot weather prevailed in the Far West and Northeast this August. It was especially hot in the interior of California where the temperatures at Fresno reached or exceeded 100°F. on the first 19 days, a 79-yr. August record. Heat records were also broken in the Northeast where Harrisburg, Pa., had its warmest August and Washington, D.C., its greatest number of days (19) with temperatures of 90°F. or higher.

The temperature pattern in the United States was closely related to the mean circulation. Lower than normal temperatures were primarily the result of strong blocking centered over Davis Strait and northerly anomalous flow at 700 mb. (figs. 1 and 2) and sea level (not shown). Below normal 700-mb. heights also favored cool weather. This circulation pushed a series of cold fronts with their cool Pacific and Canadian air masses into the deep South. Warm weather in the Far West was primarily the result of a strong ridge during the first half of the month. Southerly anomalous flow ahead of the trough over the Mississippi Valley (figs. 1 and 2) favored warm conditions in the Northeast. The lack of precipitation also contributed to above normal temperatures, not only in the Northeast, but in portions of the Far West.

Persistence of month-to-month temperature, usually quite high from July to August, was very low this year. Of 100 cities nearly evenly distributed over the United States, only 8 remained in the same temperature class (out

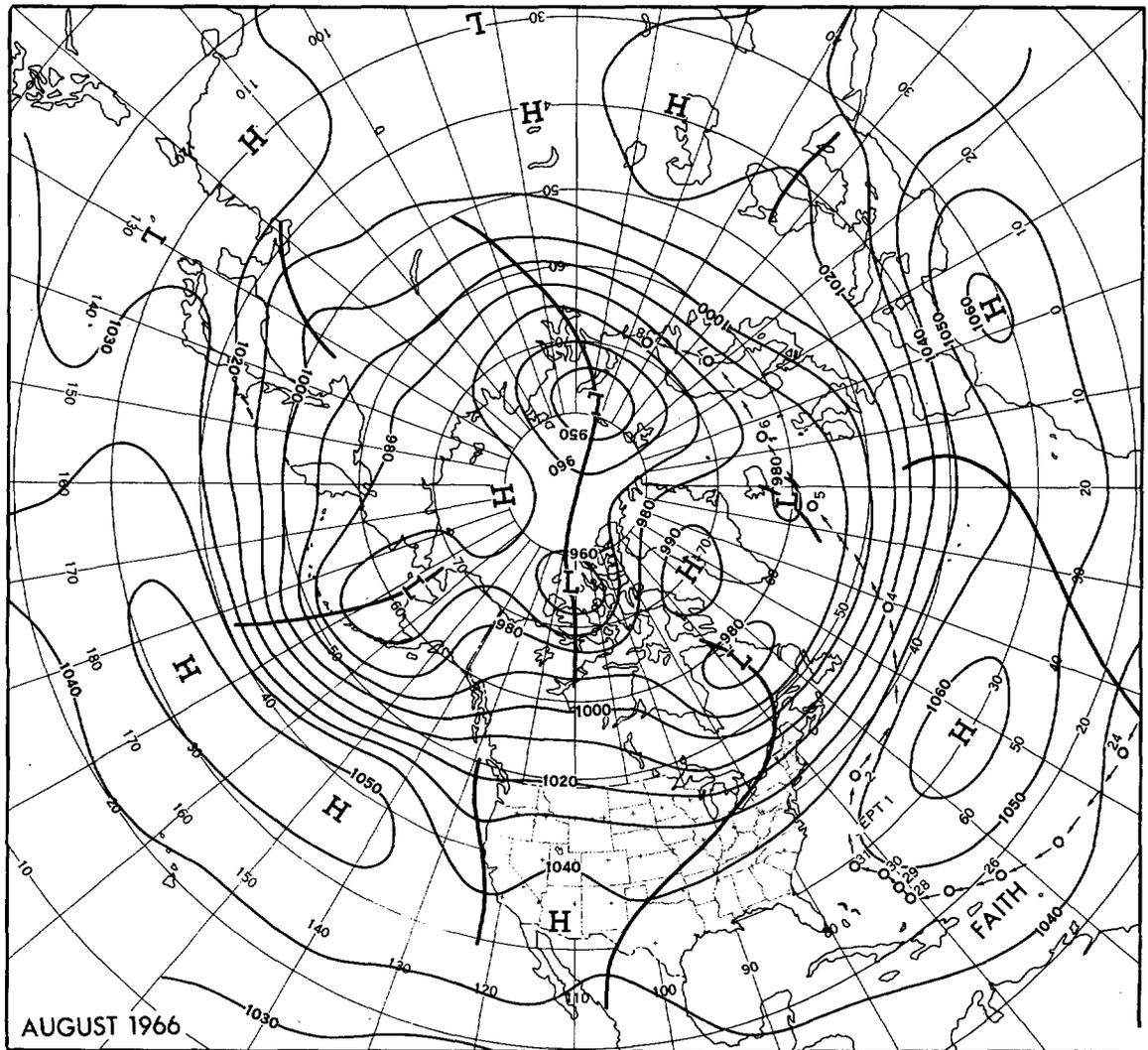


FIGURE 1.—Mean 700-mb. contours (tens of feet) for August 1966. Heavy vertical lines indicate principal long-wave troughs. Track of hurricane Faith shown with 1200 GMT positions indicated by circles.

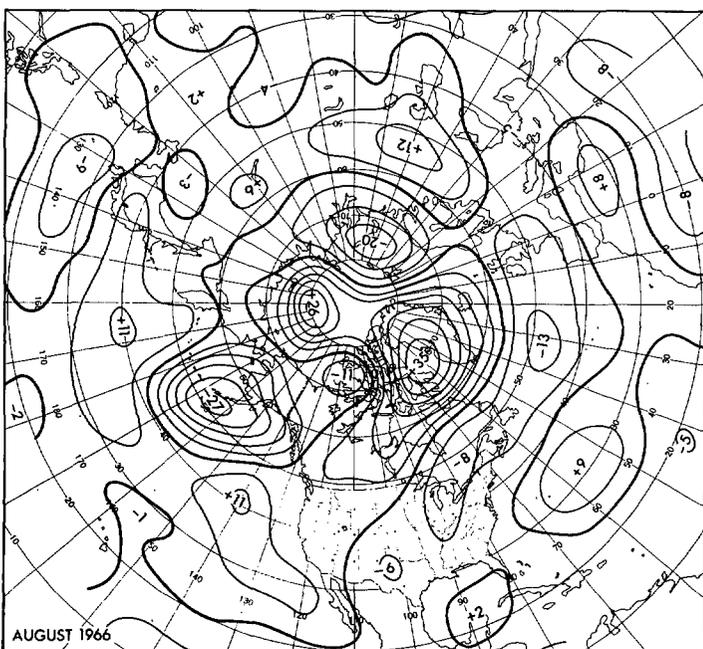


FIGURE 2.—Departure of mean 700-mb. heights from normal (tens of feet) for August 1966.

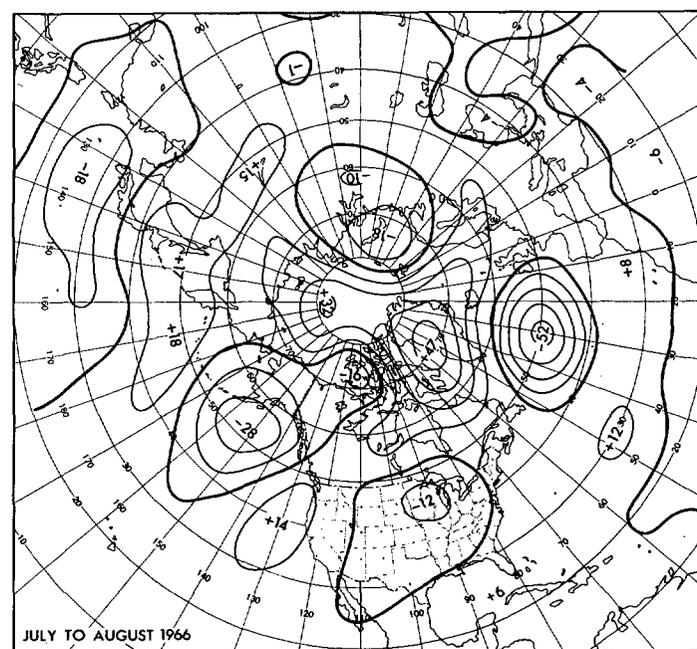


FIGURE 3.—Change in monthly mean 700-mb. height anomaly (tens of feet) from July to August 1966.

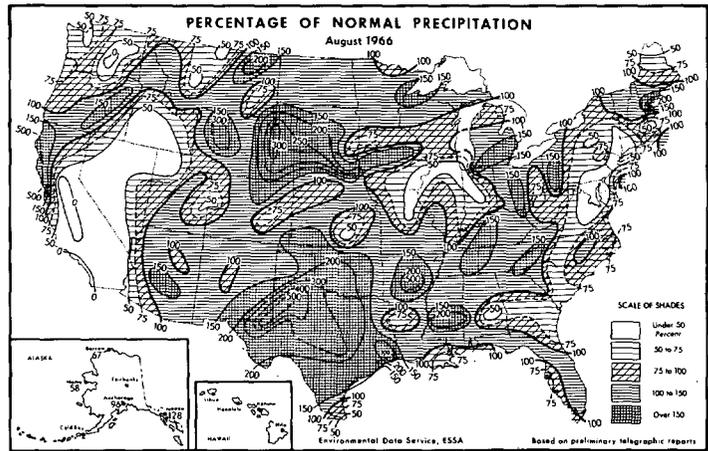
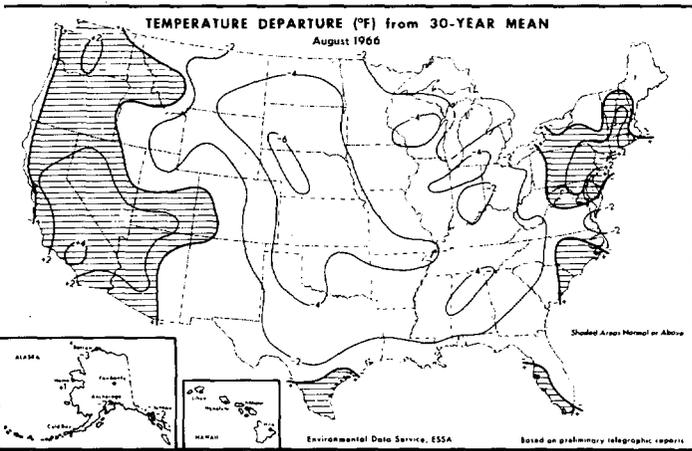


FIGURE 4.—Departure of average surface temperature from normal (°F.) for August 1966, (from [2]).

FIGURE 5.—Percentage of normal precipitation for August 1966, (from [2]).

of 5*), while 70 became cooler. Of the latter, 55 cooled by two or more classes. In the Far West most temperature changes indicated warming by two classes.

3. PRECIPITATION

Rainfall ranged from near to above normal in most areas from the Rockies to the Appalachians (fig. 5). Amounts were as much as five times normal in Texas and Arkansas. New records for total August rainfall were established at Port Arthur, Tex. (17.26 in.) and Little Rock, Ark. (14.46 in.). A new record was also set at Valentine, Nebr. (6.67 in.). Heavy precipitation in the Southern Plains was related to the deeper-than-normal trough in that area (figs. 1 and 2). Most of the rains fell in connection with slow-moving cold fronts. These were associated with a series of migratory Lows which moved across the Northern States and which spread generally heavy precipitation from the Northern and Central Rocky Mountain States through the Great Lakes and central New England. An area that was notably dry was a portion of the middle Mississippi Valley, close to the mean trough but just south of the primary storm track.

Drought conditions continued to prevail in the Great Basin where August rainfall was negligible under the influence of the very weak ridge over the Rockies and the trough along the Pacific Coast. No rain fell in California until the end of the month when a deep daily trough moved inland.

August was another dry month in the Middle Atlantic States where only half the normal rain fell (fig. 5). As a result, the long-period drought continued. This was the second driest August of record at Trenton, N.J., where rainfall was only 0.72 in., 15 percent of normal. Dry weather in the Middle Atlantic States was in apparent contradiction to the mean 700-mb. circulation for August

(figs. 1 and 2). This shows southwesterly anomalous flow over the area, a condition which usually produces more precipitation. One explanation may be that most frontal passages occurred at night when stability is normally greatest. In addition, no migratory Lows passed over the area.

4. INTRAMONTHLY VARIABILITY

The early August 700-mb. circulation over North America and the adjacent oceans was very similar to that for the entire month (figs. 1 and 2). The trough in eastern North America was slightly east of its monthly position. As a consequence, the temperature pattern was displaced eastward with sub-normal temperatures from the Great Plains to the Atlantic coast. A strong cold front moving southward from Canada brought an end to the hot weather which had prevailed in most areas east of the Rockies after mid-June. This was the coolest week of August east of the Appalachians where temperatures averaged from 3° to 6° F. below normal. The front was accompanied by severe shower activity with heaviest rainfall in the Southeast where the front became stationary.

Retrogression occurred during the second week as the trough in the eastern United States was displaced to the Midwest. At the same time blocking over Greenland retrograded to Hudson Bay and the circulation over western North America became cyclonic. The pattern of weekly average temperature departure from normal also was nearly identical with the monthly pattern (fig. 4). Departures in the Central Plains ranged to -12° F. The East warmed to above normal under the influence of southwesterly upper flow, while the Far West remained hot. Readings of 100° F. or more continued in the interior of California, although average temperatures were slightly lower as a result of weakening of the ridge aloft. Locally excessive rains fell during the week in Nebraska, Arkansas, and Texas, with severe flooding in some areas.

*The upper and lower octiles, and the middle three quartiles.

About a foot fell in eastern Nebraska and southern Texas.

Retgression continued in the third week as the Bermuda High extended its influence across the South and into the Middle Mississippi Valley. The Midwest trough of the previous week sheared; the northern portion moved to the Northeast while the southern part became a weak cyclonic feature over New Mexico and north-central Mexico. This evolution brought weather more typical of summer with widespread shower activity over much of the Nation. This was the warmest week of the month over the country, although temperatures continued to be well below normal from the Great Lakes through the northern portion of the Great Plains and Rocky Mountains.

During the fourth week the western Canadian ridge strengthened and cold Canadian air pushed into the deep South. Greatest temperature departures (-15° F.) were in the Southern Plains. A slow-moving cold front brought heavy rains (up to 4 in.) to central Texas and southeastern New Mexico and was partly responsible for the cool conditions. Cooling also occurred in California and western portions of Washington and Oregon, in association with a trough along the coast. Little, if any, precipitation fell in the Great Basin, and the drought and potential fire hazard remained high.

5. TROPICAL STORMS

Hurricane Faith was the only tropical storm to threaten the coastline of North America during August. The path of Faith around the Atlantic subtropical anticyclone is shown in figure 1, a circulation pattern also representative of that which prevailed during the exact period of the storm. Faith was first located on the 22d as a tropical storm in the eastern Atlantic, and reached hurricane strength the next day. The storm moved westward at a nearly uniform speed until reaching a position north of the Dominican Republic on the 27th. It then turned on a more north-northwesterly course, slowed its forward speed, and its winds intensified to 120 m.p.h. Faith recurved toward the northeast on the 31st, and moved rapidly across the Atlantic in the fast westerlies. The storm became extratropical on September 6 as it passed over the Faeroe Islands, eventually moving into the mean Low near Novaya Zemlya.

Four tropical storms were observed in the eastern Pacific during August. All of these moved westward in the easterlies but only Connie threatened the Hawaiian Islands. This storm finally passed several hundred miles to the south of Hawaii on the 16th with little, if any, effect on the weather there.

Tropical storm activity in the western Pacific was greater than usual in August. Of nine tropical cyclones observed, six reached typhoon intensity (64 kt. or greater), compared with an average number for August (1952-65) of five tropical cyclones, four of which reached typhoon intensity. This unusual amount of activity was re-

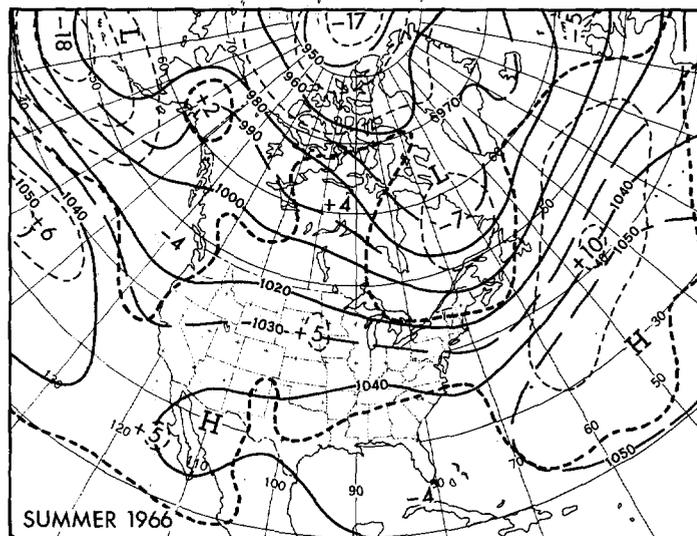


FIGURE 6.—Mean 700-mb. contours (solid) and height departures from normal (short dashed) (both in tens of feet) for summer (June, July, August) 1966.

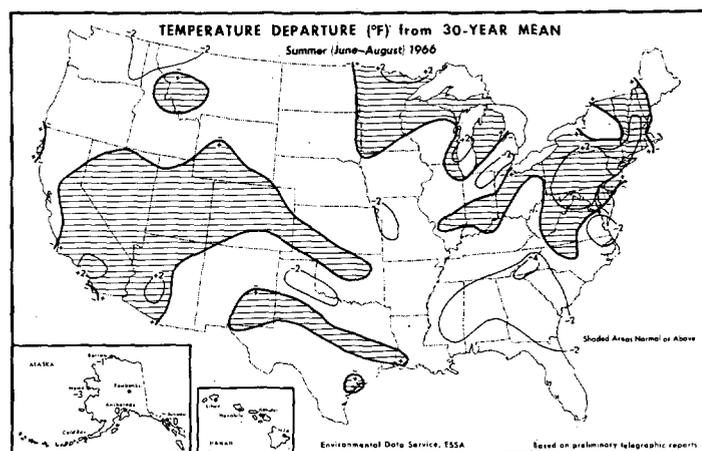


FIGURE 7.—Departure of average surface temperature from normal ($^{\circ}$ F.) for summer (June, July, August) 1966, (from [2]).

flected in the mean circulation by the extensive area of below normal 700-mb. heights (fig. 2) and sea level pressure (not shown) south of Japan.

6. SUMMER 1966

The average 700-mb. circulation for summer 1966 (June-August) (fig. 6) was more zonal (with respect to normal) over the United States than was its counterpart in 1965. As a result summer 1966 was warmer over most of the Nation than summer 1965, when temperatures averaged below normal over nearly the entire country. Above normal temperatures this year were confined to the Northeast, Great Lakes Region, and most of the Southwest (fig. 7). Hot weather prevailed in the Middle Atlantic States during all three months. At Washington,

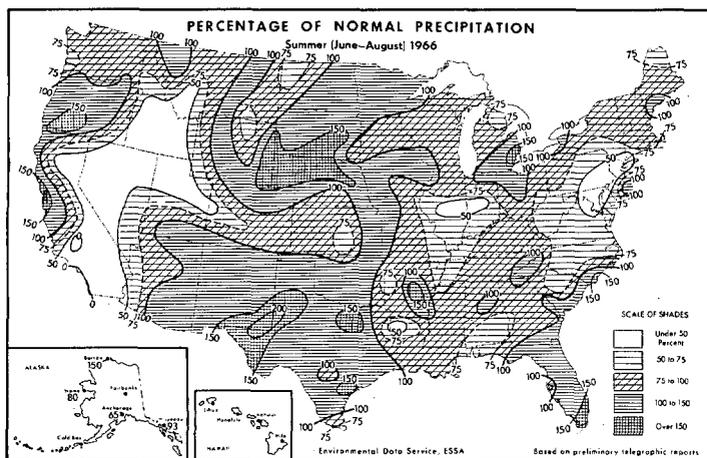


FIGURE 8.—Percentage of normal precipitation for summer (June, July, August) 1966, (from [2]).

D.C., the mean temperature for summer equaled the previous record established in 1872 and 1943. The number of days with 90° F. or above was the greatest on record at Washington (54) and Harrisburg, Pa. (56).

Precipitation was near to above normal from the

Mississippi River to the Continental Divide, in the extreme Southeast, and in portions of the West Coast States and eastern Lakes Region (fig. 8). Drought continued in the Northeast where stronger-than-normal westerly flow (fig. 6) favored less-than-normal rainfall. Washington, D.C., had only 4.62 in., equaling the total for the record dry summer of 1962. At the end of August the area of critical drought extended from southern New England southwestward to include central Virginia and eastern West Virginia. The flow of water in the Potomac River was at its lowest level in history, and well below the average for August 1930, the previous worst drought year on record.

Drought also prevailed in many of the Western States where summer rainfall was mostly well below normal (fig. 8), continuing a trend started earlier this year. Thus far 1966 has been the driest year of record at Helena, Mont. (3.71 in.) and Reno, Nev. (0.65 in.).

REFERENCES

1. J. W. Posey, "The Weather and Circulation of July 1966—A Month With an Extensive Heat Wave," *Monthly Weather Review*, vol. 94, No. 10, Oct. 1966, pp. 619-626.
2. Environmental Data Service, ESSA, *Weekly Weather and Crop Bulletin, National Summary*, vol. 53, Nos. 36, 37, Sept. 5, 12, 1966.